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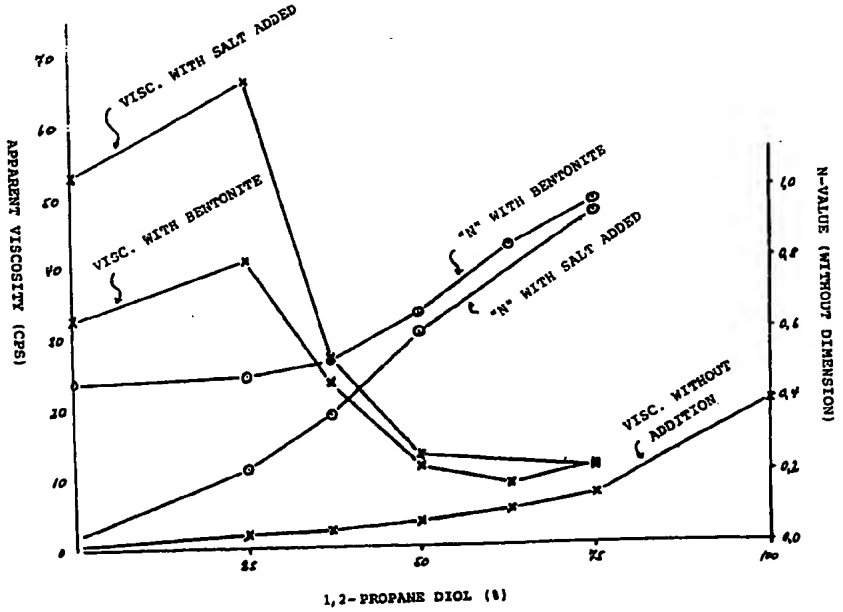
(54) Title: BASE FLUID FOR THE PREPARATION OF FLUIDS APPLICABLE IN CONNECTION WITH EXPLOITATION OF PETROLEUM RESERVOIRS



(57) Abstract

A base fluid consisting of 1,2-propanediol (propylene glycol) which, optionally in mixture with other fluids, may be used as the starting point for the production of various fluids to be used in drilling, completion, work-over and stimulation of weels drilled for petroleum sources. Thereby, the swelling of clay minerals in the penetrated rocks is reduced at the same time as disadvantageous environmental consequences associated with the use of other, commonly employed fluids are avoided. The base fluid consists of 5-100, preferably 25-70 % by volume of water.

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US	United States of America

Base fluid for the preparation of fluids applicable in connection with exploitation of petroleum reservoirs.

In the recovery of petroleum reservoirs several different liquids are generally used having different functional designations.

Examples of such designations are: drilling fluid (drilling mud), cement slurry, completion fluid, packer fluid, perforation fluid, gravel packing fluid, acidizing fluid and fracturing fluid. These fluids comprise a base fluid normally constituting the main part of the total volume, added various components.

At present either water, oil or emulsions thereof in different ratios are used as a base material for the different kinds of functional liquids.

"Water" as used herein comprises either water from a natural source such as fresh water, brackish water or sea water, or water particularly purified by processes such as e.g. filtration, ion exchange or distillation. The term "oil" as used herein comprises crude oil or different fractions thereof, with or without modifications. Typical products for the current uses comprise diesel oil ("Fuel oil No. 2") and particular low aromatic fractions, either mainly paraffinic or mainly naphthenic.

Additionally, it is known from Larson, D.E. & al.: "Non-polluting Drilling Fluid Composition and Concentrate therefore", GB 2.084.632 A, that animal and/or vegetable oils mainly consisting of triglycerides may be used as a basic material for some of the different kinds of functional fluids.

Among the shortcomings normally occuring in connection with water based liquid systems may particularly be mentioned:

Many of the formations being penetrated by a well drilled for petroleum sources contain minerals which are not inert to water. This relates particularly to some clay minerals having the common designation "swelling clay". This comprises most of the substituted members of the smectite group.

Rocks containing such minerals will show a tendency to swell on contact with water based liquid systems. This becomes to apparent in two different ways:

- swelling of the formation in the hole wall.

- disintegration of drill cuttings during transport to the surface.

Another problem of water based fluids may be that great efforts are required in order to maintain stable properties. A considerable use of chemicals is often required for maintenance which also causes increased costs.

Water based fluid systems used in the completion, work-over and stimulation of hydrocarbon producing wells may further produce swelling of clay minerals in the adjacent formation. This may result in a reduction of the permeability of the formation and thus also the productivity of the well.

Oil based mud systems provide better stabilization of the hole wall. Further, the mud is usually better with respect to filtration control and properties at high temperatures.

The shortcomings of drilling mud on an oil basis is primarily the high cost per volume unit. Another aspect is that such mud and residues thereof may have an unfavourable effect on the marine environment. This is partly sought to be compensated for by the transition to low aromatic oils.

Oil based mud generally requires a larger and more complicated facility for preparing and handling. This includes equipment for cleaning drill cuttings. In addition to the costs of such facilities this entales obvious disadvantages such as extra weight and increased space requirement which may be critical on offshore installations.

Fluid systems based on oil or oil/water emulsions have in addition disadvantageous impact on the working environment, unfavourable safety aspects such as fire and explosion hazards. Several oil based systems also comprise chemicals which may contribute to change the wetting preferences of the formation close to the well in a negative sense in view of future productivity.

The objective of the invention is to provide an alternative base fluid for use in preparing different well liquids. This shall in certain connections provide an improvement as compared to existing fluid systems.

This objective is achieved by using as a base fluid for the different functional fluid types 1,2-propanediol in an

amount constituting 5-100% by volume and preferably in excess of 25% by volume and particularly ranging from 25 to 70% by volume of the total amount of basic liquid, the balance being water. To this base fluid suitable additives are subsequently added to provide a functional liquid having the desired properties.

1,2-propanediol is a clear, viscous liquid. It is slightly volatile and nearly odourless. 1,2-propanediol is hygroscopic and water miscible in all proportions. It is scarcely flammable, chemically and technically stable and considered as non-toxic. Further it is degradable in water.

The benefits achieved by the invention is that liquid systems possessing enhanced properties compared with existing systems are obtained. In relation to other liquid systems based on water the benefits will be the following:

- By contact with swelling clay minerals the fluid systems containing the base fluids of the invention will be less prone to swelling. This will reduce the problems associated withthe process disclosed above.
- The base fluid disclosed possesses properties requiringless amounts of additives to provide the desired rheology and activity within the fluid.

In relation to oil or oil/water-emulsions, the benefits of the base fluid disclosed are the following:

- Liquid systems prepared from the base fluid of the invention will be less toxic both with regard to the marine environment as well as to industrial hygiene.
- A consequence of the above facts is that drill cuttings, drilled by a fluid of said basis will not require further cleaning before being discarded from offshore platforms. This implies that the need of equipment for such cleaning is eliminated and thus provides economy as to purchase and operation of the equipment, as well as savings of space and weight on the platform.
- Generally speaking said base fluid utilized for the different types of functional fluids will be simpler and require less equipment for preparation, maintenance, handling and storage.

- The fluids prepared from said base fluid will entail less fire and explosion risk. Possible fires may be combatted by water.

Tests have been performed in order to elucidate properties of 1,2-propanediol as a basis in the preparation of well fluids. A description of the performed tests as well as the results achieved are presented in the following in the form of an example.

Example

To test the potential of 1,2-propanediol to prevent clay from swelling, a fixed amount of smectite (Wyoming Bentonite) was added to solutions of water/1,2-propanediol in different ratios of composition. The rheological properties of these solutions were tested before addition of bentonite, after addition, after being left overnight and finally mixed with a small amount of saturated brine solution.

The mixing of the samples and the subsequent viscosity measurements were performed according to API standard ("API Specification for Oil-Well Drilling Fluid-Materials", API Spec 13A, Eight Ed., American Petroleum Institute, Dallas, March 1981, and "API Recommended Practice: Standard Procedure for Testing Drilling Fluids", API RP 13B, Ninth Ed., American Petroleum Institute, Dallas, May 1982) and may be summarized as follows:

- To a standard amount of bentonite (22.5 g) the water/1,2-propanediol mixture (350 ml) is added and mixed for 20 minutes by means of a Hamilton Beach Mixer (medium velocity,11000 r.p.m).
- The rheology of the sample is measured at 40°C with a Fann VG-meter (Modell 35 SA 12 R) and a thermocup (Baroid).
- After being left at ambient conditions for 18 hours, the sample is mixed for 1 minute with the same equipment, and viscosity and gel strength is determined.
- A saturated brine solution (5 ml) is added and stirred for 1 minute, then the rheology is measured again.

In the test the XC-polymer was added to provide viscosity, using the same process of preparation and testing of the sample.

For a supplemental disclosure of the technical, chemical and physical properties it is referred to the data sheet concerning 1,2-propanediol ("Technisches Merkblatt 1,2 propanediol (propyleneglycol)", BASF, May 1982).

The results of the rheology measurements performed on samples comprising water, 1,2-propanediol and bentonite are summarized in tabular form. All samples are prepared and tested according to said above-mentioned method. In the table the following designations are used:

A = solvent only (water/1,2-propanediol)
B = subsequent to the addition of bentonite
C = after being left overnight at room temperature
D = after the addition of a brine solution
N.T. = not tested.

PROPERTY: Apparent viscosity, μ_A (mPa.s)

SAMPLE NO	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	32.5	29.5	53.0
2	25	75	1.8	40.5	41.3	65.8
6	37.1	62.9	2.3	23.0	21.8	26.5
3	50	50	3.3	11.0	11.3	12.5
5	62.9	37.1	4.8	8.5	N.T.	N.T.
4	75	25	7.0	10.8	10.5	10.5

PROPERTY: Plastic viscosity, μ_p (mPa.s)

SAMPLE NO.	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	18.0	17.0	2.5
2	25	75	1.5	23.0	25.5	18.5
6	37.1	62.9	2.0	14.0	14.0	12.0
3	50	50	3.0	8.0	9.5	8.5
5	62.9	37.1	4.5	7.5	N.T.	N.T.
4	75	25	7.0	10.5	10.5	10.0

PROPERTY: Yield Point, YP (Pa)

SAMPLE NO.	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	14.8	12.8	51.6
2	25	75	0.3	17.9	16.1	48.3
6	37.1	62.9	0.3	9.2	7.9	14.8
3	50	50	0.3	3.1	1.8	4.1
5	62.9	37.1	0.3	1.0	N.T.	N.T.
4	75	25	0.0	0.3	0.0	0.5

PROPERTY: Flow index, n (dimensionless)

SAMPLE NO.	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	0.468	0.490	0.034
2	25	75	0.807	0.482	0.533	0.219
6	37.1	62.9	0.848	0.523	0.560	0.370
3	50	50	0.893	0.652	0.791	0.599
5	62.9	37.1	0.925	0.839	N.T.	N.T.
4	75	25	1.000	0.966	1.000	0.932

PROPERTY: Consistency index, K ($Pa.s^n$)

SAMPLE NO.	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	1.30	1.01	42.8
2	25	75	0.01	1.47	1.05	14.7
6	37.1	62.9	0.01	0.63	0.46	2.08
3	50	50	0.01	0.12	0.05	0.20
5	62.9	37.1	0.01	0.03	N.T.	N.T.
4	75	25	0.01	0.01	0.01	0.02

PROPERTY: Initial gel strength, G_o (Pa)

SAMPLE NO.	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	4.1	3.6	41.9
2	25	75	0.0	5.4	6.4	36.8
6	37.1	62.9	0.0	1.8	2.6	11.2
3	50	50	0.0	0.8	1.0	2.6
5	62.9	37.1	0.0	0.3	N.T.	N.T.
4	75	25	0.0	0.3	0.3	0.3

PROPERTY: Final gel strength, G_{1o} (Pa)

SAMPLE NO.	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	14.3	15.3	53.4
2	25	75	0.0	24.0	23.0	47.5
6	37.1	62.9	0.0	9.7	10.0	11.5
3	50	50	0.0	2.0	2.0	3.6
5	62.9	37.1	0.0	0.8	N.T.	N.T.
4	75	25	0.0	0.8	0.5	0.5

Measurements performed on water/1,2-propanediol in the ratio 50/50 to which polymer has been added are presented below. Method of mixing and test conditions are identical with the samples to which bentonite has been added. XC-polymer ("Kelzan") is used in a concentration of 2.86 g/l. The letters A - D have the same meaning as above.

PROPERTIES (units)	A*	B	C	D
Apparent viscosity, μ_A (mPa.s)	3.3	15.8	16.0	16.3
Plastic viscosity, μp (mPa.s)	3.0	10.0	10.0	10.0
Yield Point, Y.P. (Pa)	0.3	5.9	6.1	6.4
Flow index, n (dim.less)	0.893	0.551	0.540	0.530
Consistency index, K(Pa.s^n)	0.01	0.35	0.39	0.42
Gel strength, 10s, Go (Pa)	-	2.6	2.6	2.3
Gel strength, 10m, G_{10} (Pa)	-	3.1	3.1	3.1

* Measurements not performed in connection with this sample. Values from the previous test series are introduced for comparison.

It is apparent from the enclosed graphs that the viscosity after the addition of bentonite (B) increases somewhat from 0 to 25 % by volume of 1,2-propanediol. This increase may be due to the comparative increase of the viscosity of the base fluid (A) at the same time as the concentration of 1,2-propanediol (propyleneglycol) is too low to provide a swelling inhibiting effect. The same situation is also observed for viscosity after addition of brine (D).

For 1,2-propanediol in a concentration of 37,1% and higher, the viscosity exhibits a considerable decrease. The graphs indicate that swelling of bentonite ceases for values above 50%. This is confirmed by the viscosities before and after addition of brine being approximately coincident.

The non-Newtonian character of the fluids represented by the n-values indicate a corresponding tendency. From clearly plastic fluids with low amounts of 1,2-propanediol the samples change to approximately Newtonian fluids for concentrations above approx. 65%. This is the case before as well as after addition of brine.

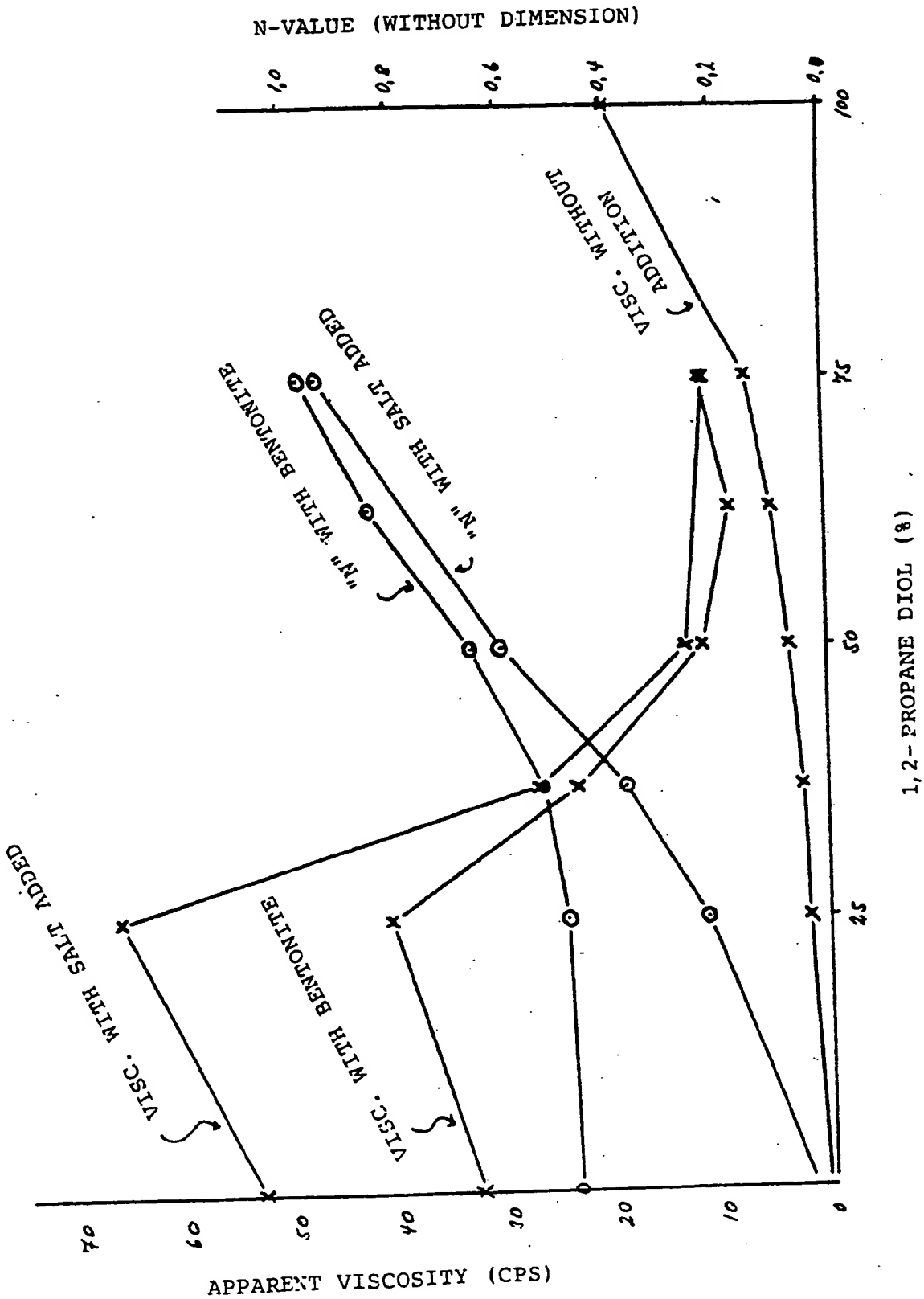
The gel strength of the samples also indicate that the bentonite is present in a dispersed state at low concentrations of 1,2-propanediol. This becomes dramatically apparent by the addition of brine. Apart from the size of the gel strength it is observed that it develops non-progressively at high concentrations of 1,2-propanediol. This means that the values after 10 seconds and 10 minutes of quiescent, respectively, are approximately similar.

The test using the XC-polymer as a viscosity agent in a 50/50 water/1,2-propanediol mixture indicates that this is a possible alternative.

Patent Claims

1. Base fluid for the preparation of various fluids to be used in drilling, completion, work-over and stimulation of wells for the production of hydrocarbons, characterized in that it contains 1,2-propanediol (propylene glycol) in an amount of 5-100 % by volume, calculated on the base fluid.

2. The base fluid of claim 1, characterized in that it contains 25-70 % by volume of 1,2-propanediol, calculated on the base fluid.


N-VALUE (WITHOUT DIMENSION)
1,0
0,8
0,6
0,4
0,2
0,0
100
75
50
25
1,2-PROPANE DIOL (%)
VISC. WITHOUT ADDITION
"N" WITH SALT ADDED
"N" WITH BENTONITE
VISC. WITH SALT ADDED
VISC. WITH BENTONITE
70
60
50
40
30
20
10
0
APPARENT VISCOSITY (CPS)

INTERNATIONAL SEARCH REPORT

International Application No PCT/N088/00063

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [5]

According to International Patent Classification (IPC) or to both National Classification and IPC [4]

C 09 K 7/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC	C 09 K 7/00, /02
US Cl	252:8.5; 8.51; 8.514; 8.515

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

CHEMABS, CLAIMS, WPI(L)
SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	US, A, 3 639 233 (R L SCHULTZ et al.) 1 February 1972 See column 2, lines 1-2, 15-16	1, 2
X	US, A, 4 280 915 (J D KERCHEVILLE) 28 July 1981 See claim 1 & NL, 7806590 GB, 2000185 FR, 2395303 DE, 2827286 CA, 1109451 NO, 146206	1, 2
X	DD, Z, 1574 67 (VEB PETROLCHEMISCHES KOMBINAT SCHWEDT) 10 November 1982 See claim 1 and page 5, line 16	1, 2
X A	US, A, 2 573 960 (P W FISCHER) 6 November 1951 See column 6, line 32	1 2

* Special categories of cited documents: [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
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International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Inga-Karin Petersson

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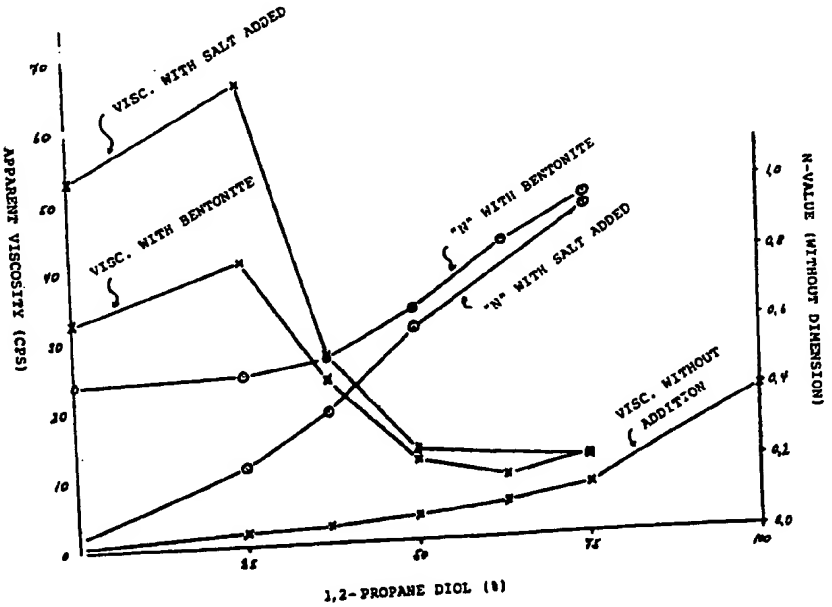

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amount constituting 5-100% by volume and preferably in excess of 25% by volume and particularly ranging from 25 to 70% by volume of the total amount of basic liquid, the balance being water. To this base fluid suitable additives are subsequently added to provide a functional liquid having the desired properties.

1,2-propanediol is a clear, viscous liquid. It is slightly volatile and nearly odourless. 1,2-propanediol is hygroscopic and water miscible in all proportions. It is scarcely flammable, chemically and technically stable and considered as non-toxic. Further it is degradable in water.

The benefits achieved by the invention is that liquid systems possessing enhanced properties compared with existing systems are obtained. In relation to other liquid systems based on water the benefits will be the following:

- By contact with swelling clay minerals the fluid systems containing the base fluids of the invention will be less prone to swelling. This will reduce the problems associated withthe process disclosed above.
- The base fluid disclosed possesses properties requiringless amounts of additives to provide the desired rheology and activity within the fluid.

In relation to oil or oil/water-emulsions, the benefits of the base fluid disclosed are the following:

- Liquid systems prepared from the base fluid of the invention will be less toxic both with regard to the marine environment as well as to industrial hygiene.
- A consequence of the above facts is that drill cuttings, drilled by a fluid of said basis will not require further cleaning before being discarded from offshore platforms. This implies that the need of equipment for such cleaning is eliminated and thus provides economy as to purchase and operation of the equipment, as well as savings of space and weight on the platform.
- Generally speaking said base fluid utilized for the different types of functional fluids will be simpler and require less equipment for preparation, maintenance, handling and storage.

- The fluids prepared from said base fluid will entail less fire and explosion risk. Possible fires may be combatted by water.

Tests have been performed in order to elucidate properties of 1,2-propanediol as a basis in the preparation of well fluids. A description of the performed tests as well as the results achieved are presented in the following in the form of an example.

Example

To test the potential of 1,2-propanediol to prevent clay from swelling, a fixed amount of smectite (Wyoming Bentonite) was added to solutions of water/1,2-propanediol in different ratios of composition. The rheological properties of these solutions were tested before addition of bentonite, after addition, after being left overnight and finally mixed with a small amount of saturated brine solution.

The mixing of the samples and the subsequent viscosity measurements were performed according to API standard ("API Specification for Oil-Well Drilling Fluid-Materials", API Spec 13A, Eight Ed., American Petroleum Institute, Dallas, March 1981, and "API Recommended Practice: Standard Procedure for Testing Drilling Fluids", API RP 13B, Ninth Ed., American Petroleum Institute, Dallas, May 1982) and may be summarized as follows:

- To a standard amount of bentonite (22.5 g) the water/1,2-propanediol mixture (350 ml) is added and mixed for 20 minutes by means of a Hamilton Beach Mixer (medium velocity,11000 r.p.m).
- The rheology of the sample is measured at 40°C with a Fann VG-meter (Modell 35 SA 12 R) and a thermocup (Baroid).
- After being left at ambient conditions for 18 hours, the sample is mixed for 1 minute with the same equipment, and viscosity and gel strength is determined.
- A saturated brine solution (5 ml) is added and stirred for 1 minute, then the rheology is measured again.

In the test the XC-polymer was added to provide viscosity, using the same process of preparation and testing of the sample.

For a supplemental disclosure of the technical, chemical and physical properties it is referred to the data sheet concerning 1,2-propanediol ("Technisches Merkblatt 1,2 propanediol (propyleneglycol)", BASF, May 1982).

The results of the rheology measurements performed on samples comprising water, 1,2-propanediol and bentonite are summarized in tabular form. All samples are prepared and tested according to said above-mentioned method. In the table the following designations are used:

A = solvent only (water/1,2-propanediol)
B = subsequent to the addition of bentonite
C = after being left overnight at room temperature
D = after the addition of a brine solution
N.T. = not tested.

PROPERTY: Apparent viscosity, μ_A (mPa.s)

SAMPLE NO	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	32.5	29.5	53.0
2	25	75	1.8	40.5	41.3	65.8
6	37.1	62.9	2.3	23.0	21.8	26.5
3	50	50	3.3	11.0	11.3	12.5
5	62.9	37.1	4.8	8.5	N.T.	N.T.
4	75	25	7.0	10.8	10.5	10.5

PROPERTY: Plastic viscosity, μ_p (mPa.s)

SAMPLE NO.	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	18.0	17.0	2.5
2	25	75	1.5	23.0	25.5	18.5
6	37.1	62.9	2.0	14.0	14.0	12.0
3	50	50	3.0	8.0	9.5	8.5
5	62.9	37.1	4.5	7.5	N.T.	N.T.
4	75	25	7.0	10.5	10.5	10.0

PROPERTY: Yield Point, YP (Pa)

SAMPLE NO.	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	14.8	12.8	51.6
2	25	75	0.3	17.9	16.1	48.3
6	37.1	62.9	0.3	9.2	7.9	14.8
3	50	50	0.3	3.1	1.8	4.1
5	62.9	37.1	0.3	1.0	N.T.	N.T.
4	75	25	0.0	0.3	0.0	0.5

PROPERTY: Flow index, n (dimensionless)

SAMPLE NO.	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	0.468	0.490	0.034
2	25	75	0.807	0.482	0.533	0.219
6	37.1	62.9	0.848	0.523	0.560	0.370
3	50	50	0.893	0.652	0.791	0.599
5	62.9	37.1	0.925	0.839	N.T.	N.T.
4	75	25	1.000	0.966	1.000	0.932

PROPERTY: Consistency index, K ($Pa.s^n$)

SAMPLE NO.	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	1.30	1.01	42.8
2	25	75	0.01	1.47	1.05	14.7
6	37.1	62.9	0.01	0.63	0.46	2.08
3	50	50	0.01	0.12	0.05	0.20
5	62.9	37.1	0.01	0.03	N.T.	N.T.
4	75	25	0.01	0.01	0.01	0.02

PROPERTY: Initial gel strength, G_o (Pa)

SAMPLE NO.	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	4.1	3.6	41.9
2	25	75	0.0	5.4	6.4	36.8
6	37.1	62.9	0.0	1.8	2.6	11.2
3	50	50	0.0	0.8	1.0	2.6
5	62.9	37.1	0.0	0.3	N.T.	N.T.
4	75	25	0.0	0.3	0.3	0.3

PROPERTY: Final gel strength, G_{1o} (Pa)

SAMPLE NO.	COMPOSITION (%) PROPYLENE GLYCOL	WATER	A	B	C	D
1	0	100	N.T.	14.3	15.3	53.4
2	25	75	0.0	24.0	23.0	47.5
6	37.1	62.9	0.0	9.7	10.0	11.5
3	50	50	0.0	2.0	2.0	3.6
5	62.9	37.1	0.0	0.8	N.T.	N.T.
4	75	25	0.0	0.8	0.5	0.5

Measurements performed on water/1,2-propanediol in the ratio 50/50 to which polymer has been added are presented below. Method of mixing and test conditions are identical with the samples to which bentonite has been added. XC-polymer ("Kelzan") is used in a concentration of 2.86 g/l. The letters A - D have the same meaning as above.

PROPERTIES (units)	A*	B	C	D
Apparent viscosity, μ_A (mPa.s)	3.3	15.8	16.0	16.3
Plastic viscosity, μp (mPa.s)	3.0	10.0	10.0	10.0
Yield Point, Y.P. (Pa)	0.3	5.9	6.1	6.4
Flow index, n (dim.less)	0.893	0.551	0.540	0.530
Consistency index, K(Pa.s^n)	0.01	0.35	0.39	0.42
Gel strength, 10s, Go (Pa)	-	2.6	2.6	2.3
Gel strength, 10m, G_{10} (Pa)	-	3.1	3.1	3.1

* Measurements not performed in connection with this sample. Values from the previous test series are introduced for comparison.

It is apparent from the enclosed graphs that the viscosity after the addition of bentonite (B) increases somewhat from 0 to 25 % by volume of 1,2-propanediol. This increase may be due to the comparative increase of the viscosity of the base fluid (A) at the same time as the concentration of 1,2-propanediol (propyleneglycol) is too low to provide a swelling inhibiting effect. The same situation is also observed for viscosity after addition of brine (D).

For 1,2-propanediol in a concentration of 37,1% and higher, the viscosity exhibits a considerable decrease. The graphs indicate that swelling of bentonite ceases for values above 50%. This is confirmed by the viscosities before and after addition of brine being approximately coincident.

The non-Newtonian character of the fluids represented by the n-values indicate a corresponding tendency. From clearly plastic fluids with low amounts of 1,2-propanediol the samples change to approximately Newtonian fluids for concentrations above approx. 65%. This is the case before as well as after addition of brine.

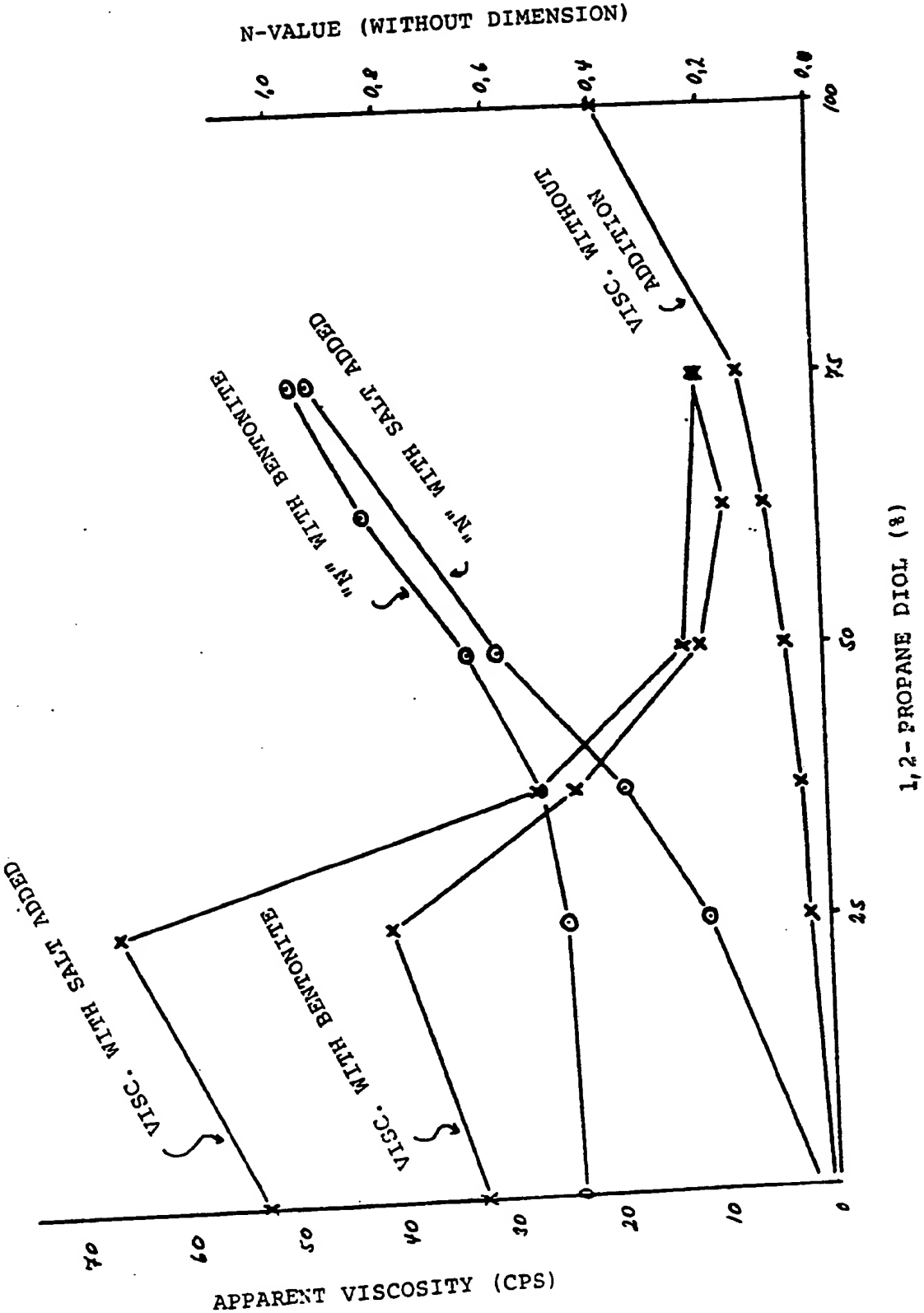
The gel strength of the samples also indicate that the bentonite is present in a dispersed state at low concentrations of 1,2-propanediol. This becomes dramatically apparent by the addition of brine. Apart from the size of the gel strength it is observed that it develops non-progressively at high concentrations of 1,2-propanediol. This means that the values after 10 seconds and 10 minutes of quiescent, respectively, are approximately similar.

The test using the XC-polymer as a viscosity agent in a 50/50 water/1,2-propanediol mixture indicates that this is a possible alternative.

Patent Claims

1. Base fluid for the preparation of various fluids to be used in drilling, completion, work-over and stimulation of wells for the production of hydrocarbons, characterized in that it contains 1,2-propanediol (propylene glycol) in an amount of 5-100 % by volume, calculated on the base fluid.

2. The base fluid of claim 1, characterized in that it contains 25-70 % by volume of 1,2-propanediol, calculated on the base fluid.


N-VALUE (WITHOUT DIMENSION)
1,0
0,8
0,6
0,4
0,2
0,0
100
75
50
25
0
1,2- PROPANE DIOL (%)
VISC. WITHOUT ADDITION
"N" WITH SALT ADDED
"N" WITH BENTONITE
VISC. WITH SALT ADDED
VISC. WITH BENTONITE
70
60
50
40
30
20
10
0
APPARENT VISCOSITY (CPS)

INTERNATIONAL SEARCH REPORT

International Application No PCT/N088/00063

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

C 07 K 7/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC	C 07 K 7/00, /02
US Cl	252:8.5; 8.51; 8.514; 8.515

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

CHEMABS, CLAIMS, WPI(L)
SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	US, A, 3 639 233 (R L SCHULTZ et al.) 1 February 1972 See column 2, lines 1-2, 15-16	1, 2
X	US, A, 4 280 915 (J D KERCHEVILLE) 28 July 1981 See claim 1 & NL, 7806590 GB, 2000185 FR, 2395303 DE, 2827286 CA, 1109451 NO, 146206	1, 2
X	DD, Z, 1574 67 (VEB PETROLCHEMISCHES KOMBINAT SCHWEDT) 10 November 1982 See claim 1 and page 5, line 16	1, 2
X A	US, A, 2 573 960 (P W FISCHER) 6 November 1951 See column 6, line 32	1 2

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1988-10-27	1988 -11- 22
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Inga-Karin Petersson

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